

# Connecting the Dots: Innovative Landfill Gas Utilization Project Development

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# Presentation Summary

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- Why develop a LFG project
- LFG tasks
- So you have a landfill: what next?
- Generate a gas model
- Consider your site's assets
- Look around
- Decide on project structure
- Link with a partner
- Think out of the box
- Plan a timeline



# Why Develop a LFG Project

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- Environmental compliance with federal regulations (NSPS/EG)
- Establish a cost-effective renewable energy resource
- Realize corporate, community or organizational goals
- Reduce landfill odors
- Reduce methane emissions
- Community relations
- Be an environmental leader
- Find an innovative solution to a local problem



# Landfill Gas Project Checklist

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- ☐ Estimate LFG recovery potential
- ☐ Perform initial assessment and feasibility study
- ☐ Link with project partners
- ☐ Establish project structure
- ☐ Evaluate project economics
- ☐ Assess financing options; secure financing
- ☐ Negotiate energy sales contract (gas, steam, or power)
- ☐ Secure permits and approvals
- ☐ Contract for engineering, procurement & construction, and operation & maintenance
- ☐ Install project



# So You Have a Landfill... What Next?

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- Determine if your landfill is a good candidate for project development
  - Landfill contains MSW
  - Landfill has about 1 million tons of waste in place
  - Landfill is at least thirty feet deep
  - Landfill is still open or recently closed
  - Site receives greater than 25 inches of rainfall annually
  - Landfill is near the power grid or industry
  - Landfill has land available for alternative applications
  - LFG utilization project is accepted by the local government and community

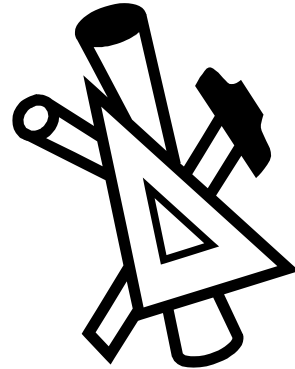
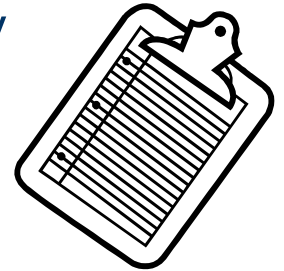




# So You Have a Landfill... What Next?

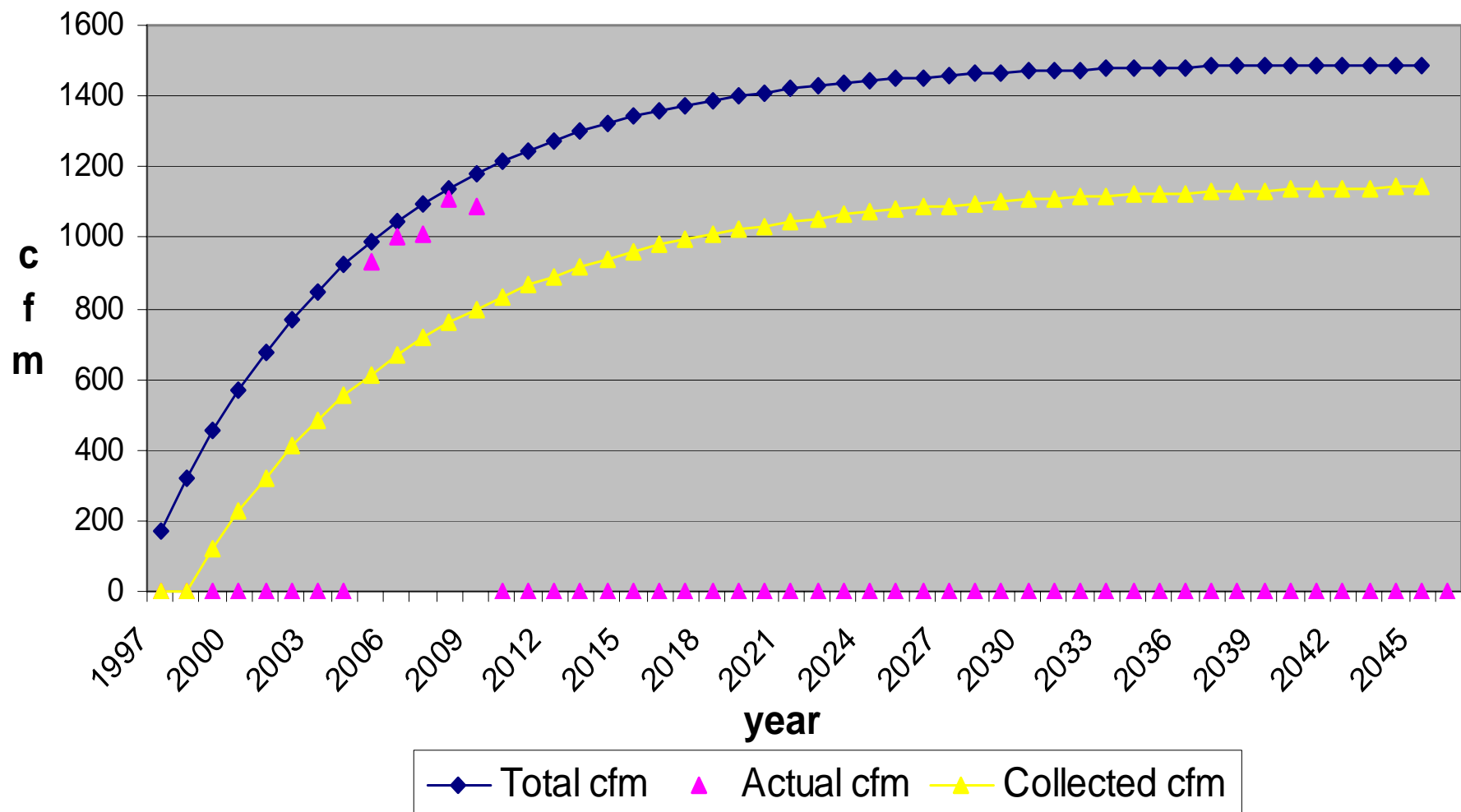
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- Conduct a formal analysis of landfill gas generation
  - Simple approximation
    - Based on waste in place
    - 1 million tons WIP = 300 cfm LFG = 0.8MW electricity
  - First order of decay
    - $LFG = 2 LoR (e^{-kc} - e^{-kt})$ 
      - $Lo$  = total methane generation potential (waste composition)
      - $K$  = rate at which methane will be released from waste (wet climate release waste faster)
  - Pump test
    - Sink test wells
    - Install monitoring probes
    - Measure gas collected



# Generate a Gas Model

## Made-up Landfill, NYS



# Consider Your Site Assets

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- Landfill owner/operator examine site
- Determine assets:
  - Supportive community, local government
  - Tax credits; Emissions reduction credits
  - Passive or active collection system
  - Leachate control system
  - Buffer zone
  - Available capital
  - Available equipment
  - Personnel





# Look Around

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- Look for project end uses
  - Examine industrial/facility uses within a 3-5 mile radius
  - Consider selling gas to local utility
  - Other innovative project options
- Identify right-of-ways
- Identify area at landfill where blower/flare station, engines could be located
- Identify barriers (private land owners, streams)



# Decide on a Project Structure

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- Option 1: Develop/manage the project internally
- Option 2: Team with a project developer
- Option 3: Team with a partner (equipment supplier, energy end user, community)



# “Self” Develop

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- Landfill owner manages development effort
- Maintains ownership and project control
- Maximize economic returns
- Internalizes most of the risk (construction, equipment performance, financial performance)



# Team With a Project Developer

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- Shifts risk to developer
- Depending on agreement, developer may assume:
  - Landfill gas ownership
  - Financing responsibilities
  - Greater financial benefit
  - Operation and maintenance control



# What to Look for in a Developer

- Ability to invest equity or access to financing
- Project development experience
- Reliable referrals
- Creativity/innovation
- Flexibility
- Customer service



## Local Project Awarded Predevelopment Grant From State Renewable Energy Fund

The Massachusetts Renewable Energy Trust (MRET) announced today the approval of a \$150,000 award to Ameresco, Inc. for the company's proposed landfill gas power project in Chicopee. The planned project is among the first in the state to win approval for funding from the Trust.

"The primary goal of the Massachusetts Renewable Energy Trust is to help the Commonwealth shift toward a greater reliance on renewable energy resources to meet the state's energy needs," said Greg Watson, director of the Trust. "This proposed landfill gas project would use a renewable resource to produce clean electricity and reduce consumers' reliance on traditional fuels such as coal and nuclear power."





# What to Look for in a Developer

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- Willing to work to meet your needs and goals
- Willing to accept project risks
- Commitment to regulatory compliance
- Critical links (state, equipment suppliers)



# Team With a Partner

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- Partner is generally a equipment vendor, engineering/procurement/construction (EPC) firm, industrial company, or fuel company
  - Share risk
  - Share financial returns
  - Generally fulfills a specific role or provides equipment
  - Compliments landfill's significant in-house expertise



# Identify Other Supportive Project Partners

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- Regulatory agencies
- Utility companies
- Governmental agencies
- Private industry
- Adjacent land owners and residents
- Financial institutions



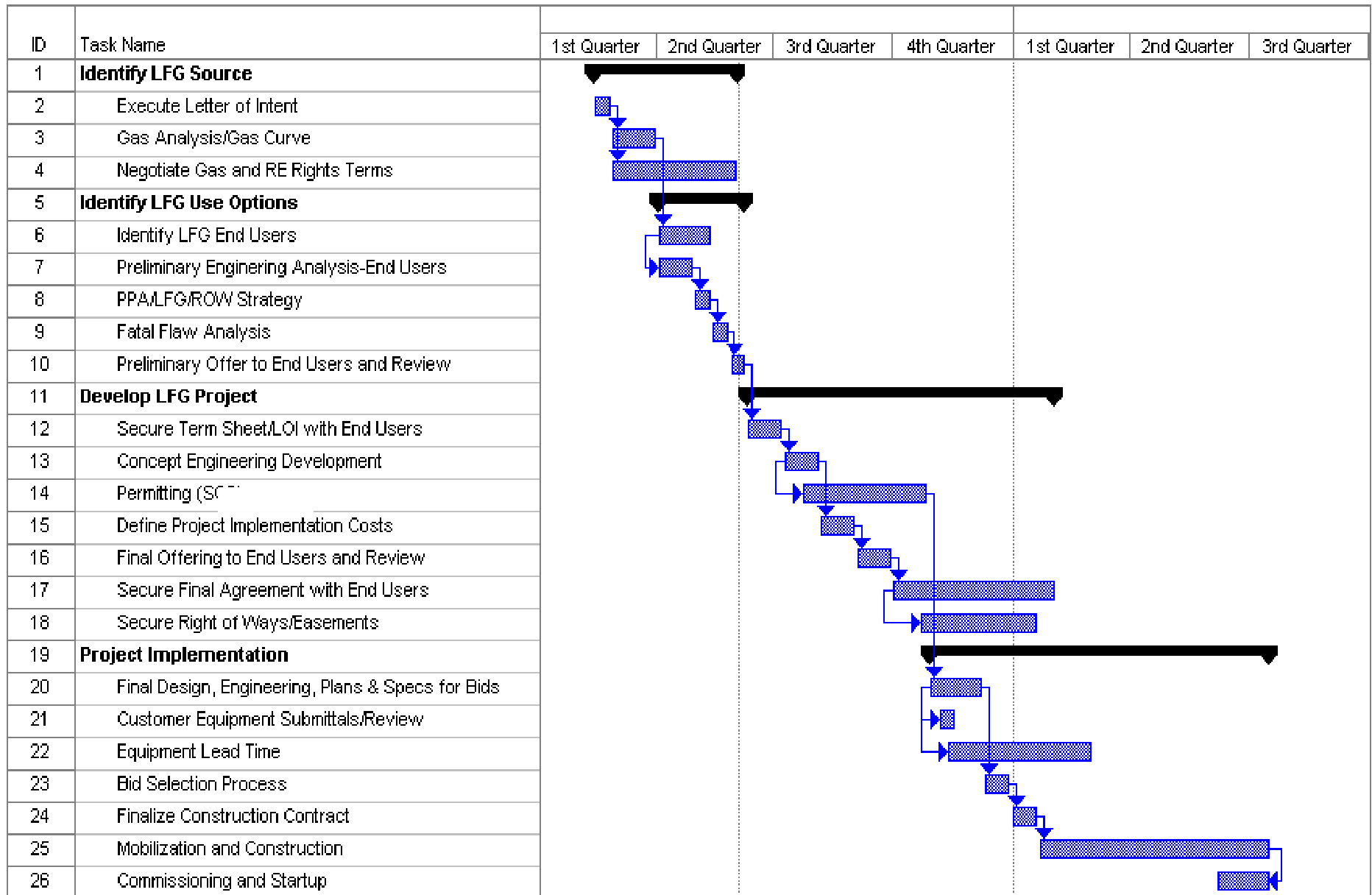
# Find and Link With a Partner

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- Issue a requests for:
  - Interest
  - Qualification
  - Proposal
- Solicit interest from developers, vendors, end users
- Determine gas rights
- Determine rights for potential emissions reductions
- Determine partner responsibilities
  - Design
  - Installation
  - Permitting
  - Operation and maintenance



# Plan an Estimated Project Timeline





# Think Out of the Box

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- Levy your assets to develop a creative project that is economically feasible
- Find creative solutions to project barriers
- Be proactive and tackle
- Build ambitious timelines



# Landfills of the Future

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- Renewable Energy Park
  - Site other renewables on site
  - Reuse of otherwise undesirable land
- Economic Development
  - Use buffer zone to attract local industry
  - Cheap power
  - Create jobs
- Develop a community resource
  - Green house; ice skating rink
  - Landfill re-development: play ground, golf course



# Example: Small Landfill Innovation

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- Energy exchange
  - Green houses, craft facilities, aqua culture
- Keys to success
  - Community engagement
  - Creative financing
  - Dedicated project manager
  - Partnerships
- Project sustainability
  - Work on solutions to future energy needs



# Questions

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